

Appl. No.: 10/812,281
Amdt. dated 12/21/2005
Reply to Office action of December 6, 2005

REMARKS/ARGUMENTS

I. Status of Claims and Summary of Rejections

Claims 1-12, 16-23, and 26-28 are now pending. Claims 26-27 are allowed. Claims 10-12, 19, and 22 were indicated to be drawn to patentable subject matter, but were objected to as being dependent on rejected claims. Claim 1 was rejected as anticipated by U.S. Patent No. 5,131,807 to Fischer et al. Claims 20-21 were rejected as anticipated by U.S. Patent Application Publication 2002/0097928 to Swinton et al.

Claim 2 was rejected as unpatentable over Fischer in view of U.S. Patent No. 4,402,618 to Fortmann et al. Claims 3-4 were rejected as unpatentable over Fischer and Fortmann, and further in view of either U.S. Patent Application Publication 2003/0169951 to Nishijima et al. or U.S. Patent Application Publication 2005/0012411 to Hoffman. Claims 5 and 13-14 were rejected as unpatentable over Fischer and Fortmann, and further in view of U.S. Patent Application Publication 2002/0039461 to Obara et al. Claims 6-7 were rejected as unpatentable over Fischer in view of Swinton. Claim 8 was rejected as unpatentable over Fischer in view of U.S. Patent No. 5,857,332 to Johnston et al. Claim 9 was rejected as unpatentable over Fischer in view of Fortmann, and further in view of U.S. Patent No. 5,890,881 to Adeff. Claim 15 was rejected as unpatentable over Fischer, Fortmann, and Obara, and further in view of either Nishijima or Hoffman.

Claim 16 was rejected as unpatentable over Fischer in view of U.S. Patent No. 4,850,721 to Malabre et al. Claim 17 was rejected as unpatentable over Fischer and Malabre, and further in view of Fortmann. Claim 18 was rejected as unpatentable over Fischer, Malabre, and Fortmann, and further in view of Swinton.

Claim 23 was rejected as unpatentable over Swinton in view of Obara.

Appl. No.: 10/812,281
Amdt. dated 12/21/2005
Reply to Office action of December 6, 2005

Claim 25 was rejected as unpatentable over U.S. Patent No. 6,668,553 to Ghizawi in view of U.S. Patent No. 5,529,464 to Emerson et al., and further in view of JP 07-208189 to Sugihara et al.

Finally, Claim 28 was rejected as unpatentable over U.S. Patent No. 6,263,672 to Roby et al. in view of U.S. Patent No. 6,964,522 to Kang et al.

Applicant sincerely appreciates the indication of allowed and allowable claims. For the reasons explained below, it is respectfully submitted that all claims as amended above are patentable over the cited references.

II. One-Piece Center Housing/Bearing Cartridge Aspect of Claims 1, 16, and 20

The claimed invention in one aspect (independent Claims 1, 16, and 20) relates to a turbocharger, and a hydrodynamic foil bearing assembly or cartridge therefor, in which the center housing is a one-piece housing (Claims 1 and 16), and the bearing cartridge is configured to be inserted as a unit into the bore of the center housing from one end thereof. The bearing assembly includes a thrust bearing assembly captured between two journal bearings. Claim 20 directed to the bearing assembly recites that each annular bearing carrier has an outer diameter greater than an outer diameter of the thrust bearing assembly such that the thrust bearing assembly does not project radially outward beyond the outer diameters of the annular bearing carriers. Such bearing assembly configuration allows the bearing assembly to be inserted into a center housing bore from one end.

In contrast, all of the cited references that have a bearing assembly comprising a thrust bearing captured between two journal bearings are characterized by the center housing being a two-piece center housing, and/or by the thrust bearing extending radially outward beyond the outer diameter of the annular bearing carriers.

For instance, Fischer in Figure 3 depicts in highly diagrammatic fashion a turbocharger having thrust bearings **24** captured between journal bearings **26, 28**, but the thrust bearings

Appl. No.: 10/812,281
Amdt. dated 12/21/2005
Reply to Office action of December 6, 2005

extend radially outward beyond the outer diameters of the journal bearings. Accordingly, it would not be possible to insert Fischer's bearing assembly as a unit into the center housing bore from one end thereof, since the thrust bearings are much larger in diameter than the parts of the bore on either side of it. Although Fischer does not explicitly say so, it is clear that his center housing would have to be made in two (left and right) pieces that fit together to capture the thrust bearings therebetween, similar to the center housing configuration shown in U.S. Patent Application Publication 2002/0097928 to Swinton et al. in Figure 3 (see center housing pieces **324** and **325** that fit together to capture the thrust bearing assembly **310**, **312**, **314** therebetween).

As noted, Swinton also teaches a two-piece center housing **324**, **325**. Swinton's bearing assembly has a thrust bearing **310**, **312**, **314** that extends radially outward beyond the outer diameters of the annular bearing carriers **328'**, **328''** (Figure 4).

Fortmann also discloses a bearing assembly in which the thrust bearing **85** (which includes disc **135** and retainer **130**) extends radially outwardly beyond the outer diameters of the annular bearing carriers **90** (Figure 1). Accordingly, it would not be possible to insert the bearing assembly as a unit into the bore of the center housing from one end thereof, since the thrust bearing is much larger in diameter than the parts of the bore on either side of it. Although Fortmann does not explicitly say so, it is clear that his center housing would have to be made in two pieces that fit together to capture the thrust bearing therebetween.

Malabre (U.S. Patent No. 4,850,721) discloses a bearing assembly that is inserted as a unit into a bore from one end thereof, but the bearing assembly does not include any thrust bearing as claimed in the present claims. The presence of the thrust bearing is what traditionally has required forming the center housing in two parts (as in Swinton, Fischer, and Fortmann). However, the claimed invention overcomes this difficulty in a way that is clearly not taught or suggested by the cited references.

Claim 1 is drawn to a turbocharger having, among other features:

Appl. No.: 10/812,281
Amdt. dated 12/21/2005
Reply to Office action of December 6, 2005

“a one-piece center housing disposed between and mounted to the compressor and turbine housings, the center housing defining a bore that receives the shaft therethrough; and
a hydrodynamic foil bearing assembly mounted in the bore of the center housing rotatably supporting the shaft, and comprising a foil thrust bearing assembly, a first foil journal bearing located between the compressor wheel and the foil thrust bearing assembly, and a second foil journal bearing located between the foil thrust bearing assembly and the turbine wheel”

None of the cited references relied on in the Office Action, and summarized above, teaches or suggests a turbocharger having both a one-piece center housing and a hydrodynamic foil bearing assembly comprising a foil thrust bearing assembly and a pair of journal bearings as claimed. Accordingly, it is submitted that the rejection based on Fischer is erroneous, and Claim 1 is patentable over Fischer and the other art of record.

Similarly, Claim 16 is drawn to a turbocharger having, among other features:

“a one-piece center housing disposed between and mounted to the compressor and turbine housings, the center housing defining a bore that receives the shaft therethrough;
a hydrodynamic foil bearing cartridge mounted in the bore of the center housing rotatably supporting the shaft, the bearing cartridge comprising a foil thrust bearing assembly retained between first and second foil journal bearings, the bearing cartridge and center housing being configured such that the bearing cartridge is insertable as a unit into the bore of the center housing from an end of the center housing adjacent the compressor.”

As should be apparent based on the remarks about Claim 1, the cited references do not teach or suggest such a turbocharger. Malabre does not teach or suggest how to configure a center housing and a bearing assembly that includes a pair of foil journal bearings and a foil thrust bearing, so that the bearing assembly is insertable as a unit into one end of the center housing. Accordingly, the rejection of Claim 16 based on Fischer Malabre is erroneous.

Claim 20 is directed to a hydrodynamic foil bearing assembly installable as a unit into a turbocharger. The bearing assembly includes a thrust bearing assembly and a foil journal bearing assembly comprising a pair of annular bearing carriers on either side of the thrust

Appl. No.: 10/812,281
Amdt. dated 12/21/2005
Reply to Office action of December 6, 2005

bearing assembly. Claim 20 has been amended to recite that each annular bearing carrier has an outer diameter greater than an outer diameter of the thrust bearing assembly such that the thrust bearing assembly does not project radially outward beyond the outer diameters of the annular bearing carriers. Support for this amendment can be found at least in Figures 2 and 3.

Claim 20 was rejected as anticipated by Swinton, but as already noted above, Swinton's thrust bearing 310, 312, 314 extends radially outward beyond the outer diameters of the annular carriers 328', 328'' (Figure 4). Accordingly, Claim 20 is not anticipated by Swinton.

Moreover, none of the other cited references discloses a bearing assembly as claimed in Claim 20. Therefore, it is submitted that Claim 20 is patentable.

II. Method Claim 28

The Office Action relied on a combination of Roby and Kang under 35 U.S.C. 103(a) to reject Claim 28. However, Kang was issued on November 15, 2005, after the filing date of the present invention, and thus qualifies as prior art only under 35 U.S.C. 102(e).

At the time the present invention was made, both the present invention/application and U.S. Patent No. 6,964,522 to Kang et al. were owned by, or subject to an obligation of assignment to, Honeywell International, Inc.

Kang is assigned to Honeywell International, Inc., as evidenced by an assignment recorded in the U.S. Patent and Trademark Office on Reel 014928, Frame 0887. The present application is also assigned to Honeywell International, Inc. , as evidenced by an assignment recorded in the U.S. Patent and Trademark Office on Reel 015161, Frame 0196.

As such, in accordance with 35 U.S.C. 103(c), Kang cannot be used in an obviousness rejection in the present application.

Therefore, the rejection of Claim 28 should be withdrawn for at least this reason.

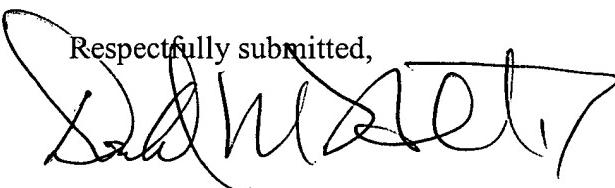
Appl. No.: 10/812,281
Amdt. dated 12/21/2005
Reply to Office action of December 6, 2005

III. Claim 22

Claim 22 has been amended to be in independent form, including all of the limitations of Claims 20 and 21 from which it depended. Therefore, Claim 22 should be in condition to be allowed, in view of the Office Action's indication of allowable subject matter.

IV. Conclusion

Based on the above amendments and remarks, it is respectfully submitted that all pending claims are patentable over the references cited in the Office Action, and the application is in condition for allowance.

Respectfully submitted,


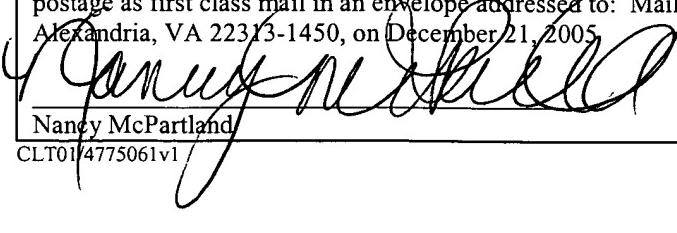
Donald M. Hill, Jr.
Registration No. 40,646

Send all correspondence regarding this application to:

Chris James
Honeywell Turbo Technologies
23326 Hawthorne Lane Blvd, Suite 200
Torrance, CA, 90505-3576
(310) 791-7850
Fax (310) 791-7855

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Mail Stop AF, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on December 21, 2005.


Nancy McPartland
CLT014775061v1